TABLE 4.—*Monthly mean heights of freezing temperatures (0° C.) during year 1941, from mean monthly values based on airplane and radiosonde observations*

| Stations | Elevation in meters (m. s. l.) | January | | February | | March | | April | | May | | June | | July | | August | | September | | October | | November | | December | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) | Number of observations | Altitude in hundreds of meters (m. s. l.) |
| Albuquerque, N. Mex. | 1,620 | | | | | 17 | 28 | 29 | 28 | 30 | 40 | 30 | 44 | 29 | 47 | 30 | 48 | 28 | 46 | 30 | 38 | 30 | 34 | 31 | 27 |
| Anchorage, Alaska | 42 | 31 | (1) | 28 | (1) | 31 | 5 | 30 | 9 | 30 | 12 | 30 | 23 | 28 | 22 | 31 | 28 | 31 | 19 | 31 | 8 | 30 | (1) | 31 | (1) |
| Atlanta, Ga. | 300 | | | | | 31 | 22 | 30 | 34 | 30 | 40 | 29 | 46 | 31 | 48 | 29 | 49 | 30 | 48 | 31 | 46 | 30 | 33 | 31 | 35 |
| Barrow, Alaska | 6 | 31 | (1) | 28 | (1) | 31 | (1) | 30 | (1) | 31 | (1) | 30 | 17 | 31 | 18 | 31 | 22 | 31 | (1) | 30 | (1) | 30 | (1) | (3) | |
| Bethel, Alaska | 7 | 31 | (1) | 27 | (1) | 31 | (1) | 28 | 3 | 31 | 8 | 30 | 22 | 31 | 24 | 30 | 29 | 29 | 22 | 31 | 5 | 24 | (1) | (3) | |
| Bismarck, N. Dak. | 505 | 31 | (1) | 27 | (1) | 30 | (1) | 30 | 21 | 30 | 32 | 29 | 39 | 31 | 46 | 30 | 43 | 30 | 35 | 31 | 28 | 30 | 17 | 31 | (1) |
| Boise, Idaho | 864 | | | | | | | | | 30 | 33 | 29 | 37 | 25 | 44 | 29 | 41 | 29 | 34 | 29 | 29 | 28 | 26 | 28 | 10 |
| Brownsville, Tex. | 6 | 31 | 37 | 27 | 38 | 31 | 39 | 28 | 44 | 31 | 45 | 29 | 50 | 31 | 49 | 31 | 49 | 31 | 51 | 31 | 49 | 30 | 42 | 31 | 42 |
| Buffalo, N. Y. | 221 | 15 | (1) | 28 | (1) | 31 | (1) | 30 | 23 | 31 | 28 | 30 | 39 | 31 | 41 | 31 | 39 | 29 | 43 | 30 | 31 | 29 | 17 | 30 | 5 |
| Charleston, S. C. | 14 | 31 | 26 | 28 | 22 | 31 | 22 | 30 | 34 | 30 | 39 | 29 | 44 | 29 | 47 | 31 | 48 | 31 | 48 | 30 | 47 | 30 | 36 | 30 | 35 |
| Denver, Colo. | 1,616 | 31 | (1) | 28 | (2) | 30 | 20 | 30 | 26 | 27 | 38 | 30 | 42 | 28 | 47 | 28 | 47 | 29 | 43 | 30 | 34 | 28 | 30 | 31 | (2) |
| Detroit, Mich. | 194 | | | | | | | | | | | | | | | 30 | 43 | 31 | 44 | 30 | 36 | 30 | 20 | 31 | 6 |
| El Paso, Tex. | 1,193 | 31 | 28 | 28 | 30 | 30 | 30 | 29 | 35 | 31 | 42 | 30 | 45 | 28 | 48 | 30 | 48 | 30 | 48 | 29 | 42 | 25 | 37 | 31 | 32 |
| Ely, Nev. | 1,908 | 31 | (1) | 28 | (2) | 31 | (2) | 30 | 23 | 31 | 36 | 30 | 40 | 31 | 47 | 29 | 44 | 31 | 38 | 31 | 31 | 30 | 30 | 31 | (1) |
| Fairbanks, Alaska | 156 | 31 | (1) | 28 | (1) | 30 | (1) | 30 | 11 | 31 | 16 | 29 | 25 | 31 | 25 | 31 | 26 | 31 | 15 | 30 | (1) | 30 | (1) | (3) | |
| Great Falls, Mont. | 1,128 | 31 | (1) | 28 | (1) | 31 | 17 | 30 | 23 | 30 | 30 | 28 | 37 | 31 | 42 | 31 | 42 | 30 | 29 | 31 | 28 | 29 | 23 | 30 | (1) |
| Huntington, W. Va. | 172 | | | | | | | | | | | | | | | 30 | 48 | 29 | 48 | 31 | 39 | 30 | 24 | 31 | 20 |
| Joliet, Ill. | 178 | 31 | (1) | 28 | (1) | 30 | (1) | 27 | 24 | (3) | | (3) | | (3) | | 26 | 41 | 28 | 44 | 27 | 36 | 30 | 22 | 30 | 10 |
| Juneau, Alaska | 49 | 28 | (1) | 27 | 3 | 30 | 8 | 28 | 11 | 29 | 15 | 28 | 21 | 26 | 27 | 29 | 28 | 31 | 20 | 27 | 13 | 29 | 4 | 31 | (1) |
| Ketchikan, Alaska | 26 | 31 | 7 | 26 | 7 | 29 | 11 | 27 | 14 | 31 | 15 | 30 | 24 | 30 | 30 | 31 | 31 | 30 | 21 | 26 | 17 | 28 | 10 | 28 | (1) |
| Lake Charles, La. | 5 | | | | | | | | | | | | | | | 28 | 50 | 27 | 50 | 30 | 48 | 28 | 37 | 31 | 38 |
| Lakehurst, N. J. | 39 | 31 | (1) | 26 | (1) | 30 | (1) | 30 | 24 | 31 | 28 | 30 | 40 | 29 | 45 | 29 | 42 | 29 | 44 | 31 | 37 | 29 | 21 | 25 | (2) |
| Medford, Oreg. | 401 | 31 | 20 | 27 | 21 | 30 | 24 | 29 | 22 | 31 | 28 | 29 | 31 | 31 | 46 | 31 | 39 | 31 | 34 | 31 | 31 | 30 | 29 | 31 | 17 |
| Miami, Fla. | 4 | 30 | 37 | 27 | 38 | 31 | 38 | 27 | 42 | 31 | 44 | 30 | 45 | 31 | 47 | 30 | 47 | 31 | 48 | 30 | 48 | 30 | 43 | 30 | 43 |
| Nashville, Tenn. | 180 | 31 | 18 | 28 | 5 | 31 | 13 | 30 | 32 | 31 | 37 | 30 | 43 | 29 | 47 | 30 | 49 | 31 | 50 | 29 | 44 | 28 | 28 | 30 | 28 |
| Nome, Alaska | 14 | 31 | (1) | 28 | (1) | 31 | (1) | 30 | (1) | 30 | 7 | 28 | 25 | 30 | 23 | 26 | 31 | 29 | 17 | 30 | 2 | 30 | (1) | (3) | |
| Norfolk, Va. | 10 | 24 | 12 | 17 | (1) | 23 | 12 | 21 | 30 | 28 | 35 | 13 | 42 | 20 | 46 | 25 | 45 | 23 | 45 | 18 | 42 | 24 | 31 | 21 | 27 |
| Oakland, Calif. | 2 | 31 | 24 | 28 | 24 | 31 | 26 | 30 | 24 | 31 | 35 | 30 | 38 | 31 | 46 | 31 | 43 | 31 | 42 | 31 | 36 | 30 | 35 | 30 | 23 |
| Oklahoma City, Okla. | 391 | 31 | 24 | 23 | 25 | 30 | 23 | 30 | 32 | 31 | 40 | 29 | 44 | 31 | 47 | 31 | 48 | 29 | 49 | 27 | 42 | 30 | 32 | 31 | 30 |
| Omaha, Nebr. | 301 | 31 | (1) | 28 | (1) | 31 | 7 | 30 | 27 | 31 | 35 | 27 | 41 | 31 | 46 | 30 | 47 | 30 | 44 | 27 | 37 | 29 | 25 | 31 | 17 |
| Pearl Harbor, T. H. | 6 | | | | | | | | | | | | | 29 | 51 | 15 | 47 | 21 | 46 | 26 | 46 | 24 | 49 | (3) | |
| Pensacola, Fla. | 24 | 27 | 32 | 28 | 28 | 31 | 30 | 27 | 39 | 26 | 45 | 28 | 46 | 20 | 46 | | | 19 | 47 | 22 | 48 | | | 22 | 37 |
| Phoenix, Ariz. | 339 | 31 | 22 | 28 | 29 | 31 | 28 | 30 | 28 | 30 | 40 | 30 | 44 | 31 | 51 | 27 | 51 | 31 | 49 | 31 | 40 | 29 | 38 | 29 | 31 |
| Portland, Maine | 20 | 30 | (1) | 28 | (1) | 31 | (1) | 30 | 20 | 27 | 24 | 30 | 35 | 31 | 40 | 31 | 34 | 31 | 41 | 30 | 25 | 30 | 12 | 29 | (1) |
| St. Louis, Mo. | 171 | 18 | 3 | 28 | (1) | 31 | 8 | 30 | 27 | 29 | 35 | 29 | 42 | 31 | 46 | 30 | 47 | 30 | 46 | 30 | 41 | 29 | 26 | 29 | 22 |
| St. Paul, Minn. | 225 | 30 | (1) | 28 | (1) | 31 | (1) | 30 | 24 | 31 | 34 | 29 | 42 | 31 | 45 | 29 | 42 | 29 | 40 | 31 | 32 | 29 | 15 | 31 | (1) |
| San Antonio, Tex. | 174 | | | | | | | 30 | 41 | 31 | 44 | 29 | 48 | 31 | 50 | 29 | 51 | 30 | 52 | 31 | 48 | 30 | 40 | 31 | 39 |
| San Diego, Calif. | 19 | 30 | 28 | 24 | 30 | 27 | 28 | 27 | 27 | 29 | 41 | 29 | 45 | 30 | 47 | 30 | 49 | 30 | 49 | 28 | 40 | 27 | 37 | 31 | 32 |
| San Juan, P. R. | 15 | | | 27 | 49 | 28 | 50 | 26 | 47 | 30 | 49 | 28 | 47 | 30 | 48 | 27 | 50 | 30 | 49 | 29 | 48 | 29 | 48 | 27 | 47 |
| Sault Ste Marie, Mich. | 221 | 31 | (1) | 28 | (1) | 31 | (1) | 30 | 19 | 31 | 27 | 30 | 37 | 31 | 40 | 31 | 35 | 30 | 36 | 31 | 25 | 30 | 5 | 31 | (1) |
| Seattle, Wash. | 27 | 17 | 15 | 28 | 18 | 31 | 19 | 28 | 20 | 30 | 22 | 30 | 27 | 30 | 39 | 31 | 35 | 29 | 25 | 31 | 25 | 30 | 20 | 20 | 8 |
| Spokane, Wash. | 598 | 31 | (2) | 27 | 15 | 31 | 18 | 30 | 22 | 31 | 27 | 30 | 33 | 31 | 41 | 29 | 38 | 30 | 26 | 31 | 26 | 29 | 20 | 31 | (1) |
| Swan Island, West Indies | 10 | 30 | 47 | 27 | 49 | 31 | 50 | 30 | 50 | 28 | 50 | 30 | 50 | 31 | 49 | 30 | 48 | 30 | 50 | 30 | 52 | 29 | 51 | 31 | 51 |
| Washington, D. C. | 24 | 24 | (1) | 21 | (1) | 31 | 8 | 29 | 28 | 29 | 31 | 30 | 42 | 26 | 47 | 26 | 46 | 31 | 48 | 31 | 40 | 30 | 27 | 29 | 18 |

[1] Surface.
[2] Mean monthly temperature at surface was 0° C. or lower, above which was an inversion with mean temperatures above freezing.
[3] Data not yet received.

At Coco Solo and St. Thomas the level of average freezing conditions was not reached.

## RIVER STAGES AND FLOODS

By BENNETT SWENSON

Precipitation was above normal during December 1941 in the Atlantic Slope States from Pennsylvania southward, the East Gulf States, the Central Plains States and all States west of the Rocky Mountains. Most of the Ohio Basin continued dry and the extreme upper and lower Mississippi basins and Texas were below normal; New England and New York were slightly below normal.

Floods mostly minor, occurred principally in portions of the Southeastern States and in the Pacific slope drainage.

*Atlantic Slope drainage.*—General heavy rains over the entire watershed of the Susquehanna River on December 23–24, produced the highest flows in the basin since the first half of April, except for the Juniata River where the previous highs were recorded in June. Stages near the flood level were reached in portions of the upper basin and a stage of 13 feet, 1 foot above flood stage, was reached in the Tioughnioga River at Whitney Point, N. Y., on the 25th.

Minor flooding occurred in portions of the Santee, Savannah, Ogeechee, and Altamaha River systems near the end of the month. Two periods of heavy rain occurred over this area during the month. The first period of rain occurred on the 3d and 4th in connection with a disturbance over the East Gulf, and caused only slight rises in the river stages but served to bring water levels above the low stages which had existed previously. On the early morning of the 23d a well-developed LOW was centered over southwestern Missouri with a ridge of high pressure along the Atlantic coast. The steep east-west pressure gradient between the advancing low-pressure system and the high-pressure ridge produced a strong influx of warm moist tropical air east of the Mississippi River and resulted in unusually heavy rains over the Southeastern States. The rivers rose rapidly, reaching flood stage, or slightly higher, at a few points. At Haw-

kinsville, Ga., in the Altamaha River basin, 7.60 inches of rain fell on the 22–23d and caused an unusual rise of 11.3 feet in the river at that point on the 24th.

No appreciable damage occurred in connection with these floods; the benefits gained from the increase in water supply probably more than offset any damage or inconvenience caused.

*East Gulf of Mexico drainage.*—Heavy rains occurred over the entire Tombigbee and Black Warrior watersheds on December 22–23, ranging from 1.25 to 2.75 inches over the Black Warrior and upper Tombigbee basins and from 3 to 6.25 inches over the lower Tombigbee basin. The stages rose rapidly, and rains again on December 25–26 caused still further rises. Flood stage was exceeded, however, only at Lock No. 3, Whitfield, Ala., on the lower Tombigbee River, where a stage of 40.6 feet was reached on December 28th.

Flood stage was also exceeded slightly at a few points in the Flint, Apalachicola and Pearl River basins, but resulted in no appreciable damage.

*Mississippi system.*—Stages were low or moderately low generally during the month and overflows were reported only in the Grand River at Chillicothe, Mo., the North Canadian River at Yukon, Okla., and the Sulphur River at Ringo Crossing, Tex. In the Grand River, heavy rains over the basin on December 22–23, caused a rise of over 18 feet in 24 hours at Chillicothe.

*Pacific Slope drainage.*—Precipitation was much above normal for the month and light to moderate floods occurred principally in the Sacramento, Willamette and and Eel River basins.

The first general rise of importance in the Sacramento River system for the present rainfall season occurred near the middle of the month in connection with an intensive rainstorm that began over the upper drainage area on December 14, and continued at intervals until the 17th. The antecedent soil moisture was fairly high due to nearly normal rainfall during the fall season.

Although no flood stage was actually reached at any reporting river station, some overflow of low ground areas occurred especially in Tehama County. Large quantitites of water were diverted at all stationary weirs into the bypasses; the maximum overflow depth at Fremont Weir into Yolo Bypass was 2.1 feet on the 20th. Little Holland Tract (2,700 acres) and Prospect Island (2,500 acres) in Yolo Bypass were flooded. As these islands had not been planted to crops this year, no tangible losses were reported.

Overflows on three separate occasions occurred during the month in the Eel River at Fernbridge, Calif. The first flood, on December 3, developed during the night and was of such slight intensity and short duration that no damage or losss resulted. The floods of December 16–17 and 18–19 were the most destructive since the flood of February 1940. The highest stage reached at Fernbridge was 21.3 feet on the 18th. The damage to flood protection works and roads, and the cost of cleaning up and removing debris is estimated at $16,000.

Floods occurred in the Willamette River basin from two storm periods, December 1–3 and 15–19. Damage from these floods was slight,

## FLOOD-STAGE REPORT, DECEMBER 1941

[All dates in December unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates | | Crest | |
|---|---|---|---|---|---|
| | | From— | To— | Stage | Date |
| ATLANTIC SLOPE DRAINAGE | | | | | |
| | *Feet* | | | *Feet* | |
| Tioughnioga: Whitney Point, N. Y. | 12 | 24 | 25 | 13.0 | 25 |
| Saluda: Pelzer, S. C. | 6 | 25 | 25 | 6.0 | 25 |
| Broad: Blairs, S. C. | 14 | 24 | 24 | 14.2 | 24 |
| Santee: Rimini, S. C. | 12 | 26 | 29 | 12.6 | 28 |
| Savannah: | | | | | |
| Butler Creek, Ga. | 21 | 25 | 26 | 21.5 | 25 |
| Clyo, Ga. | 11 | 29 | [1] | 12.1 | 31 |
| Ogeechee: | | | | | |
| Midville, Ga. | 6 | 26 | 30 | 6.2 | 27 |
| Dover, Ga. | 7 | 28 | [1] | 8.7 | 30 |
| Ocmulgee: | | | | | |
| Macon, Ga. | 18 | 24 | 24 | 18.2 | 24 |
| Abbeville, Ga. | 11 | 25 | [1] | 13.3 | 27 |
| Oconee: | | | | | |
| Milledgeville, Ga. | 20 | 24 | 27 | 23.0 | 24 |
| Mt. Vernon, Ga. | 16 | 28 | [1] | 16.8 | 31 |
| Altamaha: Charlotte, Ga. | 12 | 28 | [1] | 15.7 | 31 |
| EAST GULF OF MEXICO DRAINAGE | | | | | |
| Flint: Albany, Ga. | 20 | 26 | [1] | 21.8 | 29 |
| Apalachicola: Blountstown, Fla. | 15 | 26 | [1] | 19.4 | 30 |
| Tombigbee: Lock No. 3, Whitfield, Ala. | 33 | 25 | 31 | 40.6 | 28 |
| Pearl: Pearl River, La. | 12 | 28 | [1] | 14.1 | 30 |
| MISSISSIPPI SYSTEM | | | | | |
| *Upper Mississippi Basin* | | | | | |
| Mississippi: Louisiana, Mo. | 12 | 4 | 25 | [2] 12.3 | 24 |
| | | 27 | 28 | [2] 12.1 | 27 |
| *Missouri Basin* | | | | | |
| Grand: Chillicothe, Mo. | 18 | 24 | 26 | 23.5 | 24 |
| *Arkansas Basin* | | | | | |
| North Canadian: Yukon, Okla. | 8 | [3] | [1] | 9.8 | 6 |
| *Red Basin* | | | | | |
| Sulphur: Ringo Crossing, Tex. | 20 | 3 | 4 | [4] 22.0 | 3 |
| | | 12 | 16 | [4] 25.5 | 13 |
| | | 23 | 23 | [4] 20.0 | 23 |
| WEST GULF OF MEXICO DRAINAGE | | | | | |
| East Fork Trinity: Rockwall, Tex. | 10 | 3 | 3 | 10.7 | 3 |
| | | 12 | 15 | 11.5 | 13 |
| GULF OF CALIFORNIA DRAINAGE | | | | | |
| *Colorado Basin* | | | | | |
| Gila: Kelvin, Ariz. | 5 | 12 | 12 | 5.8 | 12 |
| PACIFIC SLOPE DRAINAGE | | | | | |
| *Eel Basin* | | | | | |
| Eel: Fernbridge, Calif. | 17.5 | 3 | 3 | 18.0 | 3 |
| | | 16 | 17 | 19.2 | 16 |
| | | 18 | 19 | 21.3 | 18 |
| *Columbia Basin* | | | | | |
| South Yamhill: | | | | | |
| Willamina, Oreg. | 8 | 19 | 20 | 10.9 | 19 |
| Whiteson, Oreg. | 38 | 19 | 21 | 41.6 | 20 |
| McKenzie: Leaburg, Oreg. | 12 | 18 | 19 | 13.8 | 18 |
| Long Tom: Monroe, Oreg. | 10 | 3 | 5 | 12.1 | 4 |
| | | 16 | 21 | 12.0 | 20 |
| | | 23 | [1] | 10.9 | 24–25 |
| Santiam: Jefferson, Oreg. | 13 | 3 | 4 | 17.2 | 3 |
| | | 19 | 21 | 16.2 | 20 |
| Luckiamute: Suver, Oreg. | 25 | 19 | 21 | 27.7 | 20 |
| Willamette: | | | | | |
| Harrisburg, Oreg. | 10 | 3 | 5 | 11.6 | 3 |
| | | 17 | 17 | 10.0 | 17 |
| | | 18 | 22 | 14.0 | 19 |
| Albany, Oreg. | 20 | 21 | 21 | 20.2 | 21 |
| Oregon City, Oreg. | 12 | 21 | 23 | 13.1 | 22 |

[1] Continued into following month.
[2] Due to manipulation of Dam No. 24.
[3] Continued from preceding month.
[4] Gage out; stages estimated.